REMARKS

In the Office Action dated January 9, 2006, claims 1, 7-14, 17, 18, 26-28, and 30 were rejected under 35 U.S.C. § 112, ¶ 1; claims 1-8, 26, and 27 were rejected under § 112, ¶ 2; claims 1-18 and 29 were rejected under § 103 over U.S. Patent No. 5,686,349 (Nakata '349) in view of U.S. Patent No. 6,271,062 (Nakata '062); claims 1, 26, 29, and 30 were rejected under § 103 over U.S. Patent No. 6,919,266 (Anh) in view of U.S. Patent No. 6,833,161 (Wang).

Claims 19-21 and 22-23 have been cancelled without prejudice to submitting the claims in a divisional application.

REJECTION UNDER 35 U.S.C. § 112, ¶ 1 (LACK OF ENABLEMENT)

The Office Action asserted that while the specification was enabling for supplying SiH_4 and H_2 for forming a microcrystalline film during a second process, the specification "does not reasonably provide enablement for forming a microcrystalline film during a second process using a first gas and a second gas." 1/9/2006 Office Action at 4. More specifically, the Office Action stated that the "specification does not provide additional direction or working examples to one of ordinary skill in the art to provide any combination of various gases . . . without undue experimentation." *Id.*

As a preliminary matter, it is respectfully submitted that the Office Action has clearly failed to satisfy the initial burden to establish a reasonable basis to question the enablement provided for the claimed invention. *See* M.P.E.P. § 2164.04 (8th ed., Rev. 3), at 2100-197. For a claimed genus, "representative examples together with a statement applicable to the genus as a whole will ordinarily be sufficient if one skilled in the art . . . would expect the claimed genus could be use in that manner without undue experimentation." M.P.E.P. § 2164.03, at 2100-196. "Proof of enablement will be required for other members of the claimed genus only where *adequate reasons are advanced by the examiner to establish that a person skilled in the art could not use the genus as a whole without undue experimentation.*" *Id.* (emphasis added).

Except for a conclusory statement of undue experimentation, the Office Action has provided *no* reason regarding why a person skilled in the art could not use the claimed genus without undue experimentation. Therefore, clearly, the Office Action has failed to satisfy the initial burden of establishing a reasonable basis to question enablement.

Moreover, the present specification clearly provided teachings regarding use of first and second gases in general for forming a microcrystalline film. On page 6, in ¶ [027], reference was made to a method that uses "a first source gas" containing an element that forms a polymer when a large number of atoms polymerize as they bond in the vapor phase and a "second source gas" that does not form a polymer in the vapor phase. Based on the teachings of ¶ [027] of the Specification and elsewhere in the Specification, a person of ordinary skill in the art would clearly have been enabled to use the claimed genus. Therefore, claims 1, 7-14, 17, 18, and 26-28 are enabled.

Similar arguments are applicable against the enablement rejection raised against dependent claims 26-28 in paragraph 4 of the Office Action on page 5.

Withdrawal of the enablement rejections is therefore respectfully requested.

REJECTION UNDER 35 U.S.C. § 112, ¶ 1 (LACK OF WRITTEN DESCRIPTION)

Claim 30 was rejected as failing to comply with the written description requirement. Support for the subject matter of claim 30 can be found in ¶¶ [033], [036], and [039] and Fig. 3(b) of the Specification. Paragraph [033] mentions that during the source depositing process depicted in Fig. 3(b), a large number of SiH_2 molecules obtained in the source supplying process are adsorbed on the surface of substrate 2 and Si atoms bond to each other to form microcrystals. Paragraph [036] mentions that a majority of SiH_4 supplied before the process of Fig. 3(a) was adsorbed on the crystal surface in the source depositing process. Paragraph [039] mentions that the source depositing process is given enough time for most of the SiH_2 in the vapor phase to be adsorbed on the substrate surface.

In view of the foregoing, it is clear that the subject matter of claim 30 has adequate written description in the Specification.

REJECTION UNDER 35 U.S.C. § 112, ¶ 2

Claim 1 has been amended to overcome the indefiniteness rejection.

REJECTION UNDER 35 U.S.C. § 103

No prior art rejections have been asserted against claims 27 and 28. In view of the fact that the § 112 rejections of these claims have been overcome, it is respectfully requested that these claims be indicated as containing allowable subject matter.

Independent claims 1 and 29 have been amended to recite formation of a microcrystalline *silicon* thin film. Both Wang and Anh relate to formation of tungsten nitride—therefore, the obviousness rejection over Wang and Anh has been overcome.

It is respectfully submitted that claim 1 is not obvious over Nakata '349 in view of Nakata '062. The Office Action conceded that Nakata '349 does not teach depositing a microcrystalline thin film during the second process. 1/9/2006 Office Action at 7.

However, the Office Action maintained that after the stop of SiH_4 in Nakata '349, that the "process of Nakata '349 inherently results in at least a quantitative amount of continual deposition, during the second step, at which H_2 is maintained at a constant rate, due to the presence of SiH_4 and H_2 remaining in the process chamber." 1/9/2006 Office Action at 7-8. The Office Action asserted that "residual SiH_4 remaining in the process chamber with the constant flow of H_2 will result in a H_2 to SiH_4 dilution ratio to deposit a quantitative amount of microcrystalline thin film directly from the vapor phase, See Nakata '062 . . . ." *Id.* at 8.

The reference to residual SiH_4 remaining in the process chamber of Nakata '349 during the hydrogen plasma treatment phase of Nakata '349 does not find support in the teachings of Nakata '349. Nakata '349 teaches deposition of an amorphous silicon layer on the substrate during the first time period in which the material gas (SiH_4) and hydrogen gas are introduced. Nakata '349, 5:45-58. On the other hand, during the period in which only the hydrogen gas is introduced, the amorphous silicon layer that *has been deposited* on the substrate 10 is subjected to a hydrogen plasma treatment to convert the deposited amorphous silicon layer into a microcrystalline layer. Nakata '349, 5:58-61; 6:26-28; 7:18-20.

What Nakata '349 clearly teaches is that the SiH_4 supplied during the first phase is used to form *amorphous* silicon. There is no teaching or suggestion, inherent or otherwise, that the application of plasma treatment during the second phase would cause *deposition* of a microcrystalline thin film. There is no suggestion in Nakata '349 of residual SiH_4 during the

second phase, and there certainly is no suggestion in Nakata '349 that any deposition of a microcrystalline thin film is being performed during the second phase.

The Nakata '062 process cited in the Office Action is a very different process. There is nothing in Nakata '349 to suggest that the "Example 1" process described in Nakata '349 can be modified to incorporate both microcrystalline thin film deposition and plasma treatment to convert amorphous silicon to microcrystalline. The specific teaching of the "Example 1" process of Nakata '349 is that amorphous silicon is first formed (when SiH_4 and H_2 are supplied), followed by conversion of the amorphous silicon to microcrystalline silicon. A person of ordinary skill would not have been motivated to modify the teachings of Nakata '349 based on the teachings of Nakata '062.

Therefore, it is respectfully submitted that claim 1 is non-obvious over Nakata '349 and Nakata '062.

Independent claim 29 is also non-obvious over Nakata '349 and Nakata '062 for similar reasons. Claim 29 recites supplying a first gas and second gas to a chamber in which a substrate is located, and depositing the microcrystalline thin film on the substrate, where prior to depositing the microcrystalline thin film, the supply of the first gas to the chamber is stopped.

Independent claim 9 is also allowable over Nakata '349 and Nakata '062. Claim 9 recites a method of forming a microcrystalline thin film by activating a first source gas containing an element that forms a polymer when a plurality of molecules of the element are bonded in a vapor phase, and forming a film having a microcrystalline structure primarily composed of the element on a film forming target object, wherein activating the first source gas comprises applying an electric field to break down the first source gas to a second gas.

The Office Action conceded that Nakata '349 fails to teach converting SiH_4 to SiH_2. 1/9/2006 Office Action at 8. However, the Office Action pointed to a discussion in the Background section of the present specification (on page 3) as providing an admission that Nakata '349 applies such an electric field to break down SiH_4 to SiH_2. *Id.* It is respectfully submitted that there existed no suggestion to apply the teachings on page 3 of the Background section of the present specification to Nakata '349. Nakata '349 in "Example 1" clearly teaches that the SiH_4 supplied during the first phase is used to form an amorphous silicon layer. Whether SiH_2 is formed or not in the first phase is *irrelevant*—Nakata '349 is unambiguous in stating that

the supplied SiH_4 is used to form amorphous silicon in the first phase. In other words, any gas used to form the amorphous silicon layer in the first phase of Nakata '349 would *not* be used to deposit a microcrystalline film during the second phase. Also, as noted above, there existed no motivation to modify the teachings of Nakata '349 based on the teachings of Nakata '062 to achieve the claimed subject matter.

Therefore, claim 9 is non-obvious over Nakata '349 and Nakata '062.

Dependent claims are allowable for at least the same reasons as corresponding independent claims.

In view of the foregoing, allowance of all claims is respectfully requested. The Commissioner is authorized to charge any additional fees and/or credit any overpayment to Deposit Account No. 20-1504 (CMO.0012US).

Respectfully submitted,

Date: March 9, 2006

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